Abstract
Classification of images can be improved for better results if combined features of image are used to categorize it. Main source of information in an image use to be its feature vectors. These are extracted by the use of various kinds of descriptors. This paper discusses the role of descriptors and their evolution from past time to this day. There have been many evolutionary based techniques also that made use of combination of descriptors to have better results in image classification task.

Keywords: GLOH, SIFT, SURF, BRISK, LESH

1. INTRODUCTION
Since new technologies have played a massive role in communication, the use of media is also increasing. Now is the time when systems are required that can describe content of different types of multimedia in order to easily classify them. In the field of image classification, description of image is the first step. Description means to find out the connection between pixels of digital image. Basically descriptors can be of two types:

1.1 General Information Descriptor
As its name specifies that these descriptors find out general type of information in an image. They give an idea about color of image i.e. study of pixels, shape of image i.e. necessary to draw histogram, regions i.e. necessary for orientation and spatial properties, textures which can cause non uniformity in the results due to non uniformity in texture, motion.

1.2 Specific Domain Information Descriptor
As its name specifies it described specific information classes in image. They are used to draw information about events or specific objects in the scene. Example of such a case would be face recognition.

2. GRADIENT LOCATION AND ORIENTATION HISTOGRAM
GLOH or Gradient Location and Orientation Histogram descriptor uses spatial and orientation based information of image into consideration while extracting image features. This type is related to SIFT i.e. Scale Invariant Feature Transformation. Both of these methods use same principles but the way of finding the feature vectors is different in GLOH.

3. SCALE INVARIANT FEATURE TRANSFORM
In any image a point of interest of user is called interest point. It can be anything like an object. In SIFT method variance in orientation or texture in image doesn’t affect the descriptor’s performance. From a group of reference images first some interest points are extracted. For the purpose of classification objects are compared with these interest points.
3.1 The Basic Working
- First step is to create scale space to ensure that scale will be invariant.
- Then interesting points are found by either Laplacian Gaussian or any other sound method.
- Keypoints are found by super fast approximation etc.
- Keypoints are that are not sound like edges and regions of low contrast are eliminated.
- To cancel out the further effect of orientation in your progress, it’s better to calculate orientation first and then perform other calculations relative to this orientation.
- To uniquely identify features, one more final representation is generated.

4. SPEEDED UP ROBUST FEATURES
In this method approximate Gaussian second derivative mask is applied to image at many scales. Basic steps are as follows:
- For detection of feature points it uses cascaded filters, where difference Gaussian is calculated on rescaled images.
- Integral image is used to make convolution of image faster.
- Points of interest are calculated using BLOB detector, which uses Hessian matrix. Let x=(x,y) is a point in image I, Hessian matrix $H(x,\partial)$ in x where $\partial$ is scale is

$$H(x,\partial)=\begin{bmatrix}
L_{xx}(x,\partial) & L_{xy}(x,\partial) \\
L_{xy}(x,\partial) & L_{yy}(x,\partial)
\end{bmatrix}$$

Where $L_{xx}(x,\partial) \rightarrow$ convolution of second order derivative $\partial^2/\partial x^2 g(\partial)$ in point x, y, $\partial_{approx}=$ current filter size*(base filter scale/ base filter size)
- For description, first reproducible orientation is fixed using knowledge of region around interest point.
- Then a square region is constructed which must be aligned to the selected orientation.

5. PCA – SIFT
This is an improved version of SIFT with Principal Component Analysis in the place of histogram.

6. Local Energy Based Shape Histogram
This type includes encoding of underlying shape by the accumulation of local energy of signal with number of filter orientations. It includes generation of histograms of different parts of image. Then a concatenated spatial histogram form is generated.

7. BINARY ROBUST INDEPENDENT ELEMENT FEATURES
It is combination of random descriptors. It is basically targeting applications of real-time world.

8. RETINA INSPIRED INVARIANT FAST FEATURE
This was designed for scale invariance along with invariance to rotation and affine image deformations. It is based on pair-wise comparisons over sampling pattern based on retina. It involves increasing point set’s discriminatory powers.
9. BINARY ROBUST INVARIANT SCALABLE KEY-POINT

- First step is to detect scale space key-point.
- BRISK is composed as a string of binary by the concatenation of results of brightness comparison test.
- This descriptor makes use of pattern used for sampling neighborhood of key-point.
- Two BRISK descriptors are matched by computing Hamming distance[2].

10. CONCLUSION

A specific model always fits better for one set of problems than the other. Choice of descriptor depends on the problem at hand so that you can choose properties that are appropriate for the solution of problem. Descriptors tell you a lot about the molecules of given image. PCA analysis is very helpful in such cases. We try that set of descriptors used should be as minimal as possible and enhanced only when highly needed.

References


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Parul Prashar has received her M.Tech degree in Computer Science Engineering from Punjab Technical University, Kapurthala in 2012. She is currently working as an Assistant Professor in UGI, Lalru. She has published 04 papers in International Journal and also presented 01 paper in TIMES national seminar 2013

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